

# SUBJECT: Science

## UNIT: Y9 Fundamentals: Energy Transfers



### Key Equations

#### Kinetic Energy

$$E = \frac{1}{2}mv^2$$

#### Gravitational energy

$$E = m \times g \times h$$

#### Elastic energy

$$E = \frac{1}{2}ke^2$$

#### Specific Heat Capacity

#### Work Done

$$\Delta E = m \times c \times \Delta\theta$$

#### Work Done

$$W = F \times s$$

#### Hooke's Law

$$F = k \times e$$

#### Quantities and units

E = Energy (J)

m = Mass (kg)

g = Gravitational field strength (N/kg)

h = Height (m)

W = Work done (N/m or J)

$\Delta\theta$  = Temperature change ( $^{\circ}\text{C}$ )

c = Specific Heat Capacity ( $\text{J}/\text{Kg}^{\circ}\text{C}$ )

k = Spring Constant (N/m)

e = Extension (m)

W = Weight

(Newtons, N)

m = Mass (kg)

k = Spring Constant (N/m)

e = Extension (m)

### Resultant Force

A single force that describes all forces acting on an object. If the resultant force is 0N then the object could be stationary or moving at a constant velocity. If the resultant force is any other number the object is accelerating/decelerating.

### Energy stores and Transfers

Energy stores – kinetic, gravitational, chemical, thermal, elastic, magnetic, electrostatic, nuclear  
Energy transfers – mechanical (force), electrical, heating, radiation (waves)

### Kinetic and Gravitational Energy

Kinetic energy describes the movement of objects. Gravitational energy describes the energy stored in an object when it is lifted.

### Elastic Potential

When an object is stretched or compressed, elastic potential energy is stored in the object.

### Circuit symbols

Cell, battery, bulb, voltmeter, ammeter, resistor, variable resistor, switch, diode, light emitting diode (LED), light dependent resistor (LDR), thermistor, fuse

### Gravity

Gravity is affected by mass and weight. In the equation we can see that mass and weight are directly proportional. An object's centre of mass is the point where weight is acting.

### Work Done and Energy Transferred

When a force acts on an object and makes it move, work is done. Energy transferred and work done are the same thing.

### Stopping Distance

The total of the braking and thinking distances.

### Braking Distance

Braking distance is the distance travelled by a vehicle once the brakes are applied. Factors that may affect this are: adverse weather, poor vehicle condition.

### Thinking Distance

Thinking distance is the distance a vehicle travels in the time it takes for the driver to apply the brakes after realising they need to stop.

### Ambitious Vocabulary

Conserved, directly proportional, scalar, vector

### Specific Heat Capacity

The specific heat capacity of an object is the amount of energy required to increase the temperature of 1kg of a material by  $1^{\circ}\text{C}$ .

### Circuit definitions

Current – the flow of charge  
Potential difference – a measure of energy transferred between two points on a circuit  
Resistance – an opposition to the flow of current

### Scalar and Vector

Scalar – a quantity that has only magnitude e.g. temperature, mass  
Vector – a quantity that has magnitude and direction e.g. velocity, displacement, force

### Hooke's Law

Independent variable- force (N)  
Dependent variable- extension (m)

Control variables- type of spring

Conclusion- Increasing the force on the spring increases the extension at a rate that is directly proportional until it's elastic limit. The gradient of the line is the spring constant of the spring.